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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/586,369	07/18/2006	Klaus Bohmhammel	292187US0PCT	2990
22850	7590	12/12/2008	EXAMINER	
OBLON, SPIVAK, MCCLELLAND MAIER & NEUSTADT, P.C. 1940 DUKE STREET ALEXANDRIA, VA 22314				NGUYEN, NGOC YEN M
ART UNIT		PAPER NUMBER		
		1793		
			NOTIFICATION DATE	
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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/586,369	BOHMHAMMEL ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	Ngoc-Yen M. Nguyen	1793	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) Responsive to communication(s) filed on 31 October 2008.
- 2a) This action is **FINAL**.                    2b) This action is non-final.
- 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) Claim(s) 1-23 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) Claim(s) \_\_\_\_\_ is/are allowed.
- 6) Claim(s) 1-23 is/are rejected.
- 7) Claim(s) \_\_\_\_\_ is/are objected to.
- 8) Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) The specification is objected to by the Examiner.
- 10) The drawing(s) filed on \_\_\_\_\_ is/are: a) accepted or b) objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) All    b) Some \* c) None of:
1. Certified copies of the priority documents have been received.
  2. Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. _____ .                                    |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date <u>9/24/08</u> . | 5) <input type="checkbox"/> Notice of Informal Patent Application |
|  | 6) <input type="checkbox"/> Other: _____.                         |

## **DETAILED ACTION**

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on October 31, 2008 has been entered.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 20-22 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 20, it is unclear if the pressure required is absolute or gauge pressure.

In claims 21 and 22, it is unclear what is being excluded by the "consists" language or included by the "comprises" language. It should be noted that in the independent claim 1, the heating element is made from "at least one metal material", which would include a metal alloy, thus, the "consists" language of claim 21 does not exclude a metal alloy and if the "consists" does not exclude a metal alloy, it is unclear what else can be included for the "comprises" language.

Claim 18 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. In the independent claim 1, the claim is drawn to a process for converting SiCl<sub>4</sub> to HSiCl<sub>3</sub>, however, in claim 18, the step of *using* the HSiCl<sub>3</sub> to produce another different product, such as alkoxysilanes, organochlorosilanes, monosilane, silicon, etc., does not further limit the subject matter of claim 1, which is a process of *producing* HSiCl<sub>3</sub> because HSiCl<sub>3</sub> is no longer the final product in claim 18.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over JP 57-118017 in view of Yamanaka et al (6,653,212), further in view of Rodgers (3,933,985).

JP '017 discloses a process for producing SiHCl<sub>3</sub> in high yield. In the process, SiCl<sub>4</sub> is mixed with H<sub>2</sub> in 4:1 to 1:10 molar ratio and introduced into the first reactor B, and by electrifying a graphite resistance 1, the interior of the reactor B is heated to 500-1,300°C to produce SiHCl<sub>3</sub> as well as HCl by-product in the presence of catalyst 9 (note

English abstract). In JP '017, any unreacted reactants can be transferred to the second reactor to further produce SiHCl<sub>3</sub>. It would have been obvious to one skilled in the art to recycle any excess reactants in order to minimize cost.

The SiCl<sub>4</sub> to H<sub>2</sub> ratio as disclosed in JP '017 overlaps the claimed range. With respect to the encompassing and overlapping ranges previously discussed, the subject matter as a whole would have been obvious to one of ordinary skill in the art at the time of invention to select the portion of the prior art's range which is within the range of the applicants' claims because it has been held *prima facie* case of obviousness to select a value in a known range by optimization for the results. *In re Boesch*, 205 USPQ 215. Additionally, the subject matter as a whole would have been obvious to one of ordinary skill in the art at the time invention was made to have selected the overlapping portion of the range disclosed by the reference because overlapping ranges have been held to be a *prima facie* case of obviousness. *In re Malagari*, 182 USPQ 549.

For the pressure, space velocity for the reaction, it would have been obvious to one of ordinary skill in the art to optimize these conditions through routine experimentation in order to obtain the best results.

For the construction material for the reactor of JP '017, it would have been within the skill of the artisan to select a construction material for the reactor that can withstand the reaction conditions.

The differences are JP '017 does not disclose (1) the use of a metal heating element (the heating element in JP '017 is a graphite resistance) and (2) the

fractionating or at least condensing the product mixture (step (a)) or passing the product stream to a direct further use (step (b)).

For difference (1), Yamanaka '212 discloses a thin film forming apparatus comprising a vacuum chamber, a substrate, a thermal catalyst, and a heating means for heating the thermal catalyst, wherein a gas introduction system for introducing a gas is connected to the vacuum chamber and wherein the gas is fed from the gas introduction system into the vacuum chamber to form a thin film on a surface of the substrate by utilizing a thermal decomposition reaction and a catalytic reaction by the thermal catalyst, the gas introduction system introduces a carrier gas containing hydrogen and a material gas for forming the thin film on the substrate, and the apparatus comprises a means for raising a concentration of the material gas in the vacuum chamber in the middle of the formation of the thin film on the substrate (note claim 1).

The thermal catalyst contains at least one type of material selected from a group consisting of tungsten, tungsten containing thoria, platinum, molybdenum, palladium, tantalum, metal deposited ceramics, silicon, alumina, silicon carbide, refractory metals (tungsten, tantalum, tungsten containing thoria, molybdenum, titanium, etc.) coated with silicon carbide or ceramics or conductive nitride films, silicon nitride or oxide, conductive metal nitrides (tungsten nitride, titanium nitride, molybdenum nitride, tantalum nitride, etc.), boronitride (BN), and silicide (note claim 24). The "at least one" fairly suggests a combination of two or more of the above listed compounds can be used, such as an alloy of more than 2 metals, etc. The thermal catalyst is preferred to be a wire made of tungsten, palladium, tantalum or molybdenum (note column 32, lines 63-65). The

thermal catalyst 5 is not limited to one formed into a coil as shown in Figures 1-3. It is also possible to form it into a grid as shown in FIG. 6. The grid-like thermal catalyst is formed by for example assembling a plurality of wires having predetermined lengths in a grid and joining assembly portions of the wires by welding or the like. Further, it is also possible to form the thermal catalyst by winding a wire, coil, or the like of the thermal catalyst one or more times around a high heat resistant insulator such as ceramics, and quartz glass. Alternatively, it is also possible to press it to a flat metal plate to form the grid (note paragraph bridging column 43-44). The power supply in the present example is a DC power supply or an AC power supply or a power supply wherein the AC is superposed on the DC and is selected in accordance with the situation. By adjusting the voltage and/or current of the power supply, it becomes possible to adjust the temperature of the thermal catalysts (note column 45, lines 1-10).

Yamanaka '212 also discloses that the apparatus can be used to produce a film of Si and Poly-Si, produced from SiH<sub>4</sub>, SiHCl<sub>3</sub>, SiCl<sub>4</sub>, etc. (note column 48, lines 52-54).

Thus, Yamanaka '212 fairly teaches that the thermal catalyst can be safely used in an atmosphere containing SiCl<sub>4</sub>, SiHCl<sub>3</sub> and H<sub>2</sub>.

For the combined teaching of JP '017 and Yamanaka '212, when the thermal catalyst, which is made from the preferred metals, tungsten, palladium, tantalum or molybdenum, is used in the process of producing SiHCl<sub>3</sub>, the thermal catalyst would inherently have the effect on the process as when the claimed heating element is used.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the thermal catalyst, as suggest by Yamanaka '212, for

heating the reactor in the process of JP '017 because such thermal catalyst is used for same purpose in an analogous condition.

Rodgers '985 can be applied to teach that when SiCl<sub>4</sub> is used to produce Si (as desired in the process of Yamanaka '212), the reaction between SiCl<sub>4</sub> and hydrogen is too slow, so the SiCl<sub>4</sub> normally reacts with hydrogen to form SiHCl<sub>3</sub> first then the SiHCl<sub>3</sub> is subsequently converted to Si.

Thus, Rodgers '985 fairly suggests that when SiCl<sub>4</sub> is used as the starting reactant in Yamanaka '212, the thermal catalyst in Yamanaka '212 may serve as a catalyst to promote the formation of SiHCl<sub>3</sub> from SiCl<sub>4</sub> first, before the SiHCl<sub>3</sub> is converted to Si film.

For difference (2), JP '017 discloses that in the second reactor, the mixed gas containing the residual unreacted SiCl<sub>4</sub> and H<sub>2</sub> is cooled and passed through a fixed metallic Si bed, the HCl is converted into SiHCl<sub>3</sub> by a reaction with the metallic Si. The resulting mixed gas of H<sub>2</sub>, SiCl<sub>4</sub> and SiHCl<sub>3</sub> is taken out of the exhaust port, and the SiHCl<sub>3</sub> is separated and collected (note English abstract).

JP '017 does not specifically disclose how the SiHCl<sub>3</sub> is separated.

Rodgers '985 discloses that after a mixture of hydrogen and silicon tetrachloride is passed through a furnace reactor unit at suitable rates and temperatures to convert a portion of the silicon tetrachloride to trichlorosilane, the reaction products from the furnace are passed through a pre-cooler to lower the temperature of the products to approximately room temperature and the room temperature gases are then passed through a condenser unit to separate the hydrogen and hydrochloric acid reaction

products from the silicon tetrachloride and chlorosilane liquid products. The hydrogen gas and the hydrochloric acid gaseous products are directed through a water scrubber which separates the hydrochloric acid from the hydrogen and the hydrogen gas after suitable drying can be reused as the hydrogen source. The liquid mixture of silicon tetrachloride and trichlorosilane is passed through a distilling unit which separates the trichlorosilane product from the silicon tetrachloride which later can be recycled (note paragraph bridging columns 2-3).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to separate the hydrogen from the silicon tetrachloride and the trichlorosilane in the process of JP '017 by condensing method and to separate the silicon tetrachloride from the trichlorosilane by distilling method (which is considered the same as the claimed "fractionating") as suggested by Rodgers '985 in order to recover hydrogen and silicon tetrachloride for recycling purposes.

Rodgers '985 is also applied to teach that after the  $\text{SiHCl}_3$  is formed, the  $\text{SiHCl}_3$  is fed to a subsequent step to produce Si (note column 1, lines 34-40 and Figures 1-2).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the  $\text{SiHCl}_3$  produced in the process of JP '017 as the reactant to produce Si as suggested by Rodgers '985 because using a product from one reaction as reactant for another reaction is well within the skill of the artisan.

Applicant's arguments filed October 31, 2008 have been fully considered but they are not persuasive.

Applicants argue that JP '107 and Yamanaka are non-analogous arts.

In response to applicant's argument that Yamanaka is nonanalogous art, it has been held that a prior art reference must either be in the field of applicant's endeavor or, if not, then be reasonably pertinent to the particular problem with which the applicant was concerned, in order to be relied upon as a basis for rejection of the claimed invention. See *In re Oetiker*, 977 F.2d 1443, 24 USPQ2d 1443 (Fed. Cir. 1992). In this case, an electric source is supplied to the graphite resistance to directly heat the reactor in the process of JP '107 and the atmosphere in the reactor comprises hydrogen, silicon tetrachloride (as reactants) and trichlorosilane (as the product). In Yamanaka '212, an electric source is also supplied to the thermal catalyst to heat up the reaction chamber and the reaction chamber contains hydrogen, silicon tetrachloride and/or trichlorosilane. Thus, the graphite resistance of JP '107 and the thermal catalyst of Yamanaka '212 are considered as analogous heating means for being used in an atmosphere containing hydrogen, silicon tetrachloride and trichlorosilane.

Applicants argue that JP '017 describes a process for producing trichlorosilane ( $\text{SiHCl}_3$ ) while Yamanaka discloses a process for making thin-film semiconductor devices.

Granted that the intended product in Yamanaka '212 is different than that of JP '017, however, Yamanaka '212 is applied to suggest that the thermal catalyst can be used instead of the graphite resistance as disclosed in JP '017 to heat up the reactor (note reasons as stated above), not to teach a process of producing trichlorosilane.

Applicants argue that the apparatus, the functions of Yamanaka '212 are different than those of JP '017.

Again, Yamanaka '212 is only relied upon to teach the thermal catalyst can be used instead of the graphite resistance.

Applicants argue that Rodgers teaches away by disclosing that "for semiconductor purposes, a reaction in which no catalytic metal appears is highly desirable".

This argument is not persuasive because the trichlorosilane product is not required to be used for semiconductor purposes. Furthermore, Yamanaka '212 discloses that the final product is suitable for using in semiconductor device even when the metal thermal catalyst was used.

Applicants argue that Yamanaka does not disclose or suggest any process carried out at pressures, space velocity recited in Applicants' claims.

Yamanaka '212 is only applied to teach the metal thermal catalyst can be used to heat up the reactor, not to teach the process conditions. As stated in the above rejection, JP '017 is applied to teach the process of producing trichlorosilane from hydrogen and silicon tetrachloride. Without a showing of criticality or unexpected results, it would have been obvious to one skilled in the art to optimize the process conditions, including pressure and space velocity, for the process of JP '017 to obtain the best results. In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642

F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ngoc-Yen M. Nguyen whose telephone number is (571) 272-1356. The examiner can normally be reached on Part time schedule.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stanley Silverman can be reached on (571) 272-1358. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Ngoc-Yen M. Nguyen/  
Primary Examiner, Art Unit 1793

nmm  
December 11, 2008